Abstract No. Guo0104

Garnet Films through a Precursor Plasma Spraying (PPS) Technique

X. Z. Guo, P. Devi., J. Parise, S. Sampath, H. Herman (SUNY, Stony Brook) and J. Hanson (BNL)

Beamline(s): X7B

Introduction: Yttrium Aluminum/Iron Garnet coatings were developed through precursor plasma spraying using radio frequency induction (RF) plasma technique [1,2]. Understanding of the phase transformation of the precursor from amorphous to crystalline garnet will be helpful to improve the spraying process.

Methods and Materials: $Y(NO_3)_3.6H_2O$, $Al(NO_3)_3.9H_2O$ or $Fe(NO_3)_3.8H_2O$, citric acid monohydrate, de-ionized water, and ethanol were used as starting materials. The conversion mechanism from the precursor to the crystalline garnet at elevated temperatures was studied using *ex-situ* X-ray diffraction, Thermal Differential Analysis (DTA), time-resolved *in-situ* X-ray diffraction, SEM and NMR.

Conclusion: Nanocrystalline garnet powders were successfully prepared using a citrate-nitrate gel combustion process. The citrate to nitrate ratio will affect the phase evolution of the precursor at the elevated temperature. Time-resolved synchrotron XRD analysis was performed for the first time during *in-situ* heating of YAG precursors. Nanostructured deposits of YAG and YIG were prepared for the first time by precursor plasma spraying (PPS) through a RF plasma technique. This is achieved by the injection of atomized liquid droplets of respective precursor sols into the plasma plume, resulting in the formation of adherent and chemically controlled garnet deposits.

Acknowledgments: This study was supported by the National Science Foundation.

References:

[1]. S. D. Parukuttyyamma, J. Margolis, H. Liu, C. P. Grey, S. Sampath, H. Herman and J. B. Parise, “Yttrium Aluminum Garnet (YAG) Films through a Precursor Plasma Spraying Technique” J. Am. Ceram. Soc. 84[8] 1906-1908 (2001)

[2]. P.S. Devi, Y. Lee, J. B. Parise, S. Sampath, H. Herman, and J. Hanson, “Yttrium aluminum garnet (YAG) powder synthesis: A combination involving citrate-nitrate gel combustion and precursor plasma spraying techniques”, Report of Center for Thermal Spray Research, SUNY at Stony Brook.